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☐ 11. Document ID: US 5967882 A

L7: Entry 11 of 15

File: USPT

Oct 19, 1999

US-PAT-NO: 5967882

DOCUMENT-IDENTIFIER: US 5967882 A

TITLE: Lapping apparatus and process with two opposed lapping platens

DATE-ISSUED: October 19, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Duescher; Wayne O.	Roseville	MN		

US-CL-CURRENT: 451/57; 451/262, 451/267, 451/360, 451/494, 451/527, 451/550

ABSTRACT:

An improved process for lapping a surface according to the present invention comprises:

- a) providing a work piece with two surfaces to be lapped,
- b) providing two rotatable platens, each having i) a back surface and ii) a front surface,
- c) providing a sheet of abrasive material having an abrasive face and a back side, the back side being on the front surface of each of the two rotatable platens with the abrasive faces of each sheet facing the other sheet,
- d) placing the work piece with two surfaces to be lapped between the two rotatable platens, so that each abrasive face faces only one of the two surfaces to be lapped,
- e) rotating the two platens at a rotational speed of at least 500 revolutions per minute,
- f) contacting each of the abrasive faces with the only one of the two surfaces to be lapped, and
- g) lapping said two surfaces of said work piece simultaneously.

17 Claims, 13 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 7

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw D
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☐ 12. Document ID: US 5910041 A

L7: Entry 12 of 15

File: USPT

Jun 8, 1999

US-PAT-NO: 5910041

DOCUMENT-IDENTIFIER: US 5910041 A

**** See image for Certificate of Correction ****

TITLE: Lapping apparatus and process with raised edge on platen

DATE-ISSUED: June 8, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Duescher; Wayne O.	Roseville	MN		

US-CL-CURRENT: 451/28; 451/494

ABSTRACT:

Lapping or polishing at high speeds with fine abrasive particles offers significant advantages in the speed of lapping, savings of time in lapping, and smoothness in the finished articles. An improved lapping system comprises a lapper platen system comprising a rotatable platen having i) a back surface and ii) a front surface, wherein the front surface of the rotating platen facing a work piece has a flat plateau or raised area which is continuous around a perimeter of the front side of said platen and the plateau is elevated with respect to a central area on the front surface. The front surface optionally has vents for air, the platen optionally has a back side to which a shaft is connected (directly or through intermediate connections) to rotate the platen and there is a front side on the platen to which is secured an abrasive sheet by reduced air pressure conveyed through said vents. The back side of the work piece holder is also optionally pivotally connected to a rotating joint which is in turn connected to a shaft which rotates said work piece. It is preferred that a frame for the system has a total weight of at least 200 kg supporting a work piece holder. It is also preferred that the work piece holder is movable on said frame. It is most preferred that the platen is rotated at a rotational velocity sufficient to generate a surface speed of at least 4,000 surface feet per minute (or even more than 20,000 surface feet per minute).

33 Claims, 11 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 5

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw D
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☐ 13. Document ID: US 5800625 A

L7: Entry 13 of 15

File: USPT

Sep 1, 1998

US-PAT-NO: 5800625
DOCUMENT-IDENTIFIER: US 5800625 A

TITLE: Removal of material by radiation applied at an oblique angle

DATE-ISSUED: September 1, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Engelsberg; Audrey C.	Milton	VT		
Johnson; Andrew W.	South Burlington	VT		
Parker; William P.	Waitsfield	VT		

US-CL-CURRENT: 134/1; 134/1.2, 257/E21.226

ABSTRACT:

An apparatus and method for removing undesired material from the surface of a substrate provides a flow of inert gas over the undesired material substrate surface while irradiating the undesired material with energetic photons directed at an angle that is oblique to the substrate. The invention enables removal of undesired material without altering the physical properties of the material underlying or adjacent the removed, undesired material. In certain circumstances, the non-perpendicular incidence permits effective removal where normal incidence caused damage to the substrate or poor removal or both.

22 Claims, 7 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 6

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw De
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☐ 14. Document ID: US 5763016 A

L7: Entry 14 of 15

File: USPT

Jun 9, 1998

US-PAT-NO: 5763016
DOCUMENT-IDENTIFIER: US 5763016 A

TITLE: Method of forming patterns in organic coatings films and layers

DATE-ISSUED: June 9, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Levenson; Eric O.	Los Altos	CA		
Waleh; Ahmad	Palo Alto	CA		

US-CL-CURRENT: 427/510; 427/259, 427/261, 427/269, 427/270, 427/272, 427/273,
427/282, 427/287, 427/322, 427/327, 427/335, 427/407.1, 427/409, 427/412.1,
427/555, 427/556, 427/557, 427/560

ABSTRACT:

Water-free, gaseous sulfur trioxide is used as an agent to form patterns in organic coatings, films, and layers, including photoresists, by etching areas exposed to the agent through an overlying mask or by developing a latent image of the desired pattern using the agent as a dry-developer.

31 Claims, 0 Drawing figures

Exemplary Claim Number: 1

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KWIC	Draw De
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☐ 15. Document ID: US 5614252 A

L7: Entry 15 of 15

File: USPT

Mar 25, 1997

US-PAT-NO: 5614252

DOCUMENT-IDENTIFIER: US 5614252 A

TITLE: Method of fabricating barium strontium titanate

DATE-ISSUED: March 25, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
McMillan; Larry D.	Colorado Springs	CO		
Paz de Araujo; Carlos A.	Colorado Springs	CO		

US-CL-CURRENT: 427/99; 257/E21.01, 257/E21.011, 257/E21.266, 257/E21.272,
257/E27.104, 427/126.1, 427/252

ABSTRACT:

A precursor liquid comprising barium and strontium 2-ethylhexanoates and titanium 2-methoxyethanol in a 2-methoxyethanol solvent is prepared, a substrate is placed within a vacuum deposition chamber, the precursor liquid is misted, and the mist is flowed into the deposition chamber while maintaining the chamber at ambient temperature to deposit a layer of the precursor liquid on the substrate. The liquid is dried, baked, and annealed to form a thin film of barium strontium titanate on the substrate. Then an integrated circuit is completed to include at least a portion of the layered superlattice material film in a component of the integrated circuit.

18 Claims, 17 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KWIC	Draw De
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☐ 1. Document ID: US 6703171 B2

L7: Entry 1 of 15

File: USPT

Mar 9, 2004

US-PAT-NO: 6703171

DOCUMENT-IDENTIFIER: US 6703171 B2

TITLE: Photomask, the manufacturing method, a patterning method, and a semiconductor device manufacturing method

DATE-ISSUED: March 9, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hattori; Takashi	Musashimurayama			JP
Gotoh; Yasuko	Mobara			JP
Satoh; Hidetoshi	Hitachinaka			JP
Tanaka; Toshihiko	Tokyo			JP
Shiraishi; Hiroshi	Hachioji			JP

US-CL-CURRENT: 430/5

ABSTRACT:

To develop a small quantity of various kinds of semiconductor devices in a short time and to realize a photomask suitable to be manufactured at a low cost. A shade pattern of a photomask is constituted by containing nanoparticles such as carbon in an organic film such as a photoresist film. A pattern is transferred to a photoresist on a semiconductor wafer by means of the reduction projection exposure using the photomask. At the time of the above exposure, it is possible to select exposure light within a range of wide wavelengths including i-line, KrF excimer laser beam, ArF excimer laser beam, or the like.

20 Claims, 32 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KWIC	Drawi De
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☐ 2. Document ID: US 6572742 B1

L7: Entry 2 of 15

File: USPT

Jun 3, 2003

US-PAT-NO: 6572742
DOCUMENT-IDENTIFIER: US 6572742 B1

TITLE: Apparatus for electrochemical fabrication using a conformable mask

DATE-ISSUED: June 3, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Cohen; Adam L.	Rancho Palos Verdes	CA		

US-CL-CURRENT: 204/297.05; 204/224R

ABSTRACT:

An electroplating method includes forming a layer, the forming of the layer includes: a) contacting a substrate with a first article, the first article includes a support and a conformable mask disposed in a pattern on the support; b) electroplating a first metal from a source of metal ions onto the substrate in a first pattern, the first pattern corresponding to the complement of the conformable mask pattern; and c) removing the first article from the substrate. The method may further involve one or more of (1) selectively depositing or non-selectively depositing one or more additional materials to complete formation of the layer, (2) planarizing deposited material after each deposition or after all depositions for a layer, and/or (3) forming layers adjacent previously formed layers to build up a structure from a plurality of adhered layers. Electroplating articles and electroplating apparatus are also disclosed.

15 Claims, 92 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 13

Full	Title	Citation	Front	Review	Classification	Date	Reference		Claims	KnowC	Drawn De
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☐ 3. Document ID: US 6475369 B1

L7: Entry 3 of 15

File: USPT

Nov 5, 2002

US-PAT-NO: 6475369
DOCUMENT-IDENTIFIER: US 6475369 B1

TITLE: Method for electrochemical fabrication

DATE-ISSUED: November 5, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Cohen; Adam L.	Rancho Palos Verdes	CA		

US-CL-CURRENT: 205/135; 205/118

ABSTRACT:

An electroplating method includes forming a layer, the forming of the layer includes: a) contacting a substrate with a first article, the first article includes a support and a conformable mask disposed in a pattern on the support; b) electroplating a first metal from a source of metal ions onto the substrate in a first pattern, the first pattern corresponding to the complement of the conformable mask pattern; and c) removing the first article from the substrate. The method may further involve one or more of (1) selectively depositing or non-selectively depositing one or more additional materials to complete formation of the layer, (2) planarizing deposited material after each deposition or after all depositions for a layer, and/or (3) forming layers adjacent previously formed layers to build up a structure from a plurality of adhered layers. Electroplating articles and electroplating apparatus are also disclosed.

53 Claims, 92 Drawing figures
Exemplary Claim Number: 39
Number of Drawing Sheets: 13

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw D
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☐ 4. Document ID: US 6231567 B1

L7: Entry 4 of 15

File: USPT

May 15, 2001

US-PAT-NO: 6231567

DOCUMENT-IDENTIFIER: US 6231567 B1

**** See image for Certificate of Correction ****

TITLE: Material remover and method

DATE-ISSUED: May 15, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Rizoiu; Ioana M.	Dana Point	CA		
Kimmel; Andrew I.	San Clemente	CA		

US-CL-CURRENT: 606/10; 606/13, 606/3

ABSTRACT:

An electromagnetically induced cutting mechanism provides accurate cutting operations on industrial materials. The electromagnetically induced cutter is adapted to interact with atomized fluid particles. A non-thermal material remover comprises a fluid and energy guide for conducting electromagnetically induced mechanical cutting forces onto a target surface.

68 Claims, 23 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 7

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw D
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5. Document ID: US 6149506 A

L7: Entry 5 of 15

File: USPT

Nov 21, 2000

US-PAT-NO: 6149506

DOCUMENT-IDENTIFIER: US 6149506 A

TITLE: Lapping apparatus and method for high speed lapping with a rotatable abrasive platen

DATE-ISSUED: November 21, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Duescher; Wayne O.	Roseville	MN		

US-CL-CURRENT: 451/59; 451/178, 451/285, 451/286, 451/36

ABSTRACT:

Lapping or polishing at high speeds with fine abrasive particles offer significant advantages in the speed of lapping, savings of time in lapping, and smoothness in the finished articles. An improved lapping system comprises a lapper platen system comprising: a) a frame (e.g., having a total weight of at least 200 kg) supporting a work piece holder b) a rotatable platen having an abrasive surface comprising an abrasive sheet secured to said platen, said platen being capable of providing surface feet per minute speeds on in outer edge of at least about 1,500 surface feet per minute; and c) a work piece holder which is movable on said frame.

73 Claims, 47 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 27

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMAC	Draw De
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6. Document ID: US 6120352 A

L7: Entry 6 of 15

File: USPT

Sep 19, 2000

US-PAT-NO: 6120352

DOCUMENT-IDENTIFIER: US 6120352 A

**** See image for Certificate of Correction ****

TITLE: Lapping apparatus and lapping method using abrasive sheets

DATE-ISSUED: September 19, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Duescher; Wayne O.	Roseville	MN		

US-CL-CURRENT: 451/41; 451/287

ABSTRACT:

Lapping or polishing at high speeds with fine abrasive particles offer significant advantages in the speed of lapping, savings of time in lapping, and smoothness in the finished articles. An improved process for lapping a surface according to the present invention comprises:

- a) providing a work piece to be lapped, having at least one surface to be lapped,
- b) providing a rotating platen having i) a back surface and ii) a flat surface which can be adjusted to a position parallel to said at least one surface of said work piece, said flat surface of said platen having openings therein through which air may flow,
- c) providing a sheet of abrasive material on said flat surface of said platen with an abrasive face of said sheet facing said at least one surface to be lapped,
- d) reducing the pressure at said back surface of said platen to secure said sheet of abrasive material to said flat surface of said platen, and
- e) rotating said platen at a rotational velocity sufficient to generate a surface speed of at least 4,000 surface feet per minute (or even more than 20,000 surface feet per minute), which, depending upon the diameter of the rotating abrasive may be at an angular speed of at least 500 revolutions per minute (which with a 15.2 cm or 6 inch diameter platen and abrasive sheet, equates to over 700 surface feet per minute at the periphery of the abrasive surface), or even more than 3,000 revolutions per minute (which with a 15.2 cm diameter abrasive sheet equates to over 4200 surface feet per minute and with a 30.4 cm or 12 inch abrasive sheet equates to over 8400 surface feet per minute) and contacting said abrasive material with said work piece. The boundary layer of any liquid (e.g., coolant or lubricant) applied to the working surface of the abrasive sheet can be controlled to improve the uniformity of the lapped surface.

29 Claims, 12 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 6

Full	Title	Citation	Front	Review	Classification	Date	References	Claims	KMC	Draw De
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☐ 7. Document ID: US 6102777 A

L7: Entry 7 of 15

File: USPT

Aug 15, 2000

US-PAT-NO: 6102777

DOCUMENT-IDENTIFIER: US 6102777 A

TITLE: Lapping apparatus and method for high speed lapping with a rotatable abrasive platen

DATE-ISSUED: August 15, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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h e b b g e e f e ef b e

Duescher; Wayne O.	Roseville	MN
Luedtke; Mark J.	Woodbury	MN
Staus; Gary A.	White Bear Lake	MN

US-CL-CURRENT: 451/36; 451/262, 451/288, 451/59

ABSTRACT:

A process for lapping a surface and providing a very smooth surface in short periods of time comprises:

- a) providing a work piece to be lapped, having at least one surface to be lapped,
- b) providing a rotating platen having
 - i) a back surface and
 - ii) a flat surface which can be adjusted to a position parallel to said at least one surface of said work piece,
- c) providing a sheet of abrasive material having an abrasive face and a back side, said back side being on said flat surface of said platen with the abrasive face of said sheet facing said at least one surface to be lapped,
- d) securing said sheet of abrasive material to said flat surface of said platen,
- e) rotating said platen at a rotational speed of at least 500 revolutions per minute, and a surface speed at an outside edge of said sheet of abrasive material of at least 1500 surface feet per minute, and
- f) contacting said abrasive face and said at least one surface of said workpiece to be lapped. The process is able to provide extremely smooth surface in a relatively short period of time.

28 Claims, 27 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 15

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw D
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☐ 8. Document ID: US 6048254 A

L7: Entry 8 of 15

File: USPT

Apr 11, 2000

US-PAT-NO: 6048254

DOCUMENT-IDENTIFIER: US 6048254 A

**** See image for Certificate of Correction ****

TITLE: Lapping apparatus and process with annular abrasive area

DATE-ISSUED: April 11, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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h e b b g e e f e ef b e

Duescher; Wayne O. Roseville MN

US-CL-CURRENT: 451/28; 451/450

ABSTRACT:

Lapping or polishing at high speeds with fine abrasive particles offer significant advantages in the speed of lapping, savings of time in lapping, and smoothness in the finished articles. An improved process for lapping a surface according to the present invention comprises:

- a) providing a work piece to be lapped, having at least one surface to be lapped,
- b) providing a rotating platen having i) a back surface and ii) a flat surface which can be placed in a position parallel to said at least one surface of said work piece,
- c) providing a sheet of abrasive material having an abrasive face with an annular distribution of abrasive on said flat surface of said platen with the abrasive face of said sheet facing said at least one surface to be lapped,
- d) securing said abrasive sheet to said platen, preferably by reducing the air pressure between said platen and said abrasive sheet to secure said sheet of abrasive material to said flat surface of said platen, and
- e) rotating said platen at a rotational velocity sufficient to generate a surface speed of at least 2,000 surface feet per minute, and contacting said abrasive material with said work piece. The boundary layer of any liquid (e.g., coolant or lubricant) applied to the working surface of the abrasive sheet can be controlled to improve the uniformity of the lapped surface.

26 Claims, 12 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 6

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw De
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☐ 9. Document ID: US 6027630 A

L7: Entry 9 of 15

File: USPT

Feb 22, 2000

US-PAT-NO: 6027630

DOCUMENT-IDENTIFIER: US 6027630 A

TITLE: Method for electrochemical fabrication

DATE-ISSUED: February 22, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Cohen; Adam L.	Rancho Palos Verdes	CA		

US-CL-CURRENT: 205/135; 205/118

h e b b g e e e f e e f b e

ABSTRACT:

An electroplating method that includes: a) contacting a first substrate with a first article, which includes a substrate and a conformable mask disposed in a pattern on the substrate; b) electroplating a first metal from a source of metal ions onto the first substrate in a first pattern, the first pattern corresponding to the complement of the conformable mask pattern; and c) removing the first article from the first substrate, is disclosed. Electroplating articles and electroplating apparatus are also disclosed.

15 Claims, 92 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 15

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draws De
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☐ 10. Document ID: US 5993298 A

L7: Entry 10 of 15

File: USPT

Nov 30, 1999

US-PAT-NO: 5993298

DOCUMENT-IDENTIFIER: US 5993298 A

TITLE: Lapping apparatus and process with controlled liquid flow across the lapping surface

DATE-ISSUED: November 30, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Duescher; Wayne O.	Roseville	MN		

US-CL-CURRENT: 451/56; 451/444

ABSTRACT:

Lapping or polishing at high speeds with fine abrasive particles offer significant advantages in the speed of lapping, savings of time in lapping, and smoothness in the finished articles. An improved lapping system comprises a lapper platen system comprising:

- a) a frame having a total weight of at least 200 kg supporting a work piece holder
- b) a rotatable platen having an abrasive surface comprising an abrasive sheet secured to said platen;
- c) a work piece holder which is movable on said frame;
- d) a means for introducing a first amount of liquid onto said abrasive surface of said platen at a location before contact between a work piece held on said work piece holder and said abrasive surface on said platen;
- e) a means for introducing a second amount of liquid onto said abrasive surface of said platen after contact between said work piece and said abrasive surface; and

f) means for directing air against said abrasive surface after introduction of said second amount of liquid.

The process of the present invention may also be described as:

- a) providing a work piece to be lapped, having at least one surface to be lapped which can be adjusted to a position parallel to said at least one surface of a rotating platen,
- b) providing a rotating platen having i) a back surface, ii) a front surface, and a periphery,
- c) providing a sheet of abrasive material having an abrasive face and a back side onto said rotating platen, with the abrasive face of said sheet facing said at least one surface to be lapped,
- d) securing said sheet of abrasive material to said front surface of said rotating platen,
- e) rotating said rotating platen at a rotational speed of at least 500 revolutions per minute, and
- f) contacting said abrasive face and said at least one surface to be lapped on said work piece,
- g) providing a first amount of liquid to assist lapping to said abrasive surface physically in front of an area where work piece contacts said abrasive face,
- h) providing a second amount of liquid to assist in washing solid material from said abrasive surface physically after said area, and directing air against said abrasive surface physically after providing said second amount of liquid to assist in removing said first and second amounts of liquid from said abrasive surface.

Rotating said platen at a high rotational velocity generates a surface speed of at least 4,000 surface feet per minute (or even more than 20,000 surface feet per minute). The boundary layer of any liquid (e.g., coolant or lubricant) applied to the working surface of the abrasive sheet is controlled by the apparatus and methods of the invention to improve the uniformity of the lapped surface.

19 Claims, 13 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 7

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KMC	Draw	Doc
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